

What is claimed is:

1. An actively cooled system, comprising:
a heat generating device, and
at least one heat transfer device, said heat transfer device comprising a refrigerant loop including a compressor for providing a superheated vapor state from a vapor stream; a condenser comprising a membrane coupled to an actuator, said condenser including a condensing surface for condensing said superheated vapor into a plurality of droplets; an evaporator for receiving said plurality of droplets, and an expansion structure interposed between said condenser and said evaporator, wherein said actuated membrane ejects said plurality of droplets toward said evaporator during refrigerant cycle intervals when said expansion structure is open;
wherein at least a portion of said heat generating device is in thermal contact with said evaporator.
2. The system of claim 1, wherein said heat generating device comprises an integrated circuit.
3. The system of claim 2, wherein said heat transfer device is integrated on a substrate upon which said integrated circuit is built.
4. The system of claim 1, wherein said heat generating device is selected from the group consisting of on board avionics, supercomputers, desktops, laptops, digital assistants, and cell phones.
5. The system of claim 1, wherein said heat transfer device comprises a plurality of said heat transfer devices.
6. The system of claim 5, wherein said heat generating device is selected from the group consisting of particle accelerators, turbine blades, laser weapons, radar systems, and rocket nozzles.
7. The system of claim 1, wherein said actuator comprises a magnetostrictive or piezoelectric material.

8. The device of claim 1, wherein said compressor membrane is responsive to electrical stimulation.

9. The system of claim 1, wherein said expansion valve provides a fully closed state and a fully open state, wherein said condenser and evaporator are in open fluid communication during intervals of operation of said device during said fully open state.

10. The system of claim 9, wherein said expansion valve is electrostatically actuated.

11. The system of claim 10, further comprising a gaseous working fluid-based heat sink thermally coupled to said condenser.

12. The system of claim 11, wherein said working fluid-based heat sink includes a plurality of micro-fins, said micro-fins having a ripple interface.

13. A personal cooling device, comprising:
at least one heat transfer device, said heat transfer device comprising a refrigerant loop including a compressor for providing a superheated vapor state from a vapor stream; a condenser comprising a membrane coupled to an actuator, said condenser including a condensing surface for condensing said superheated vapor into a plurality of droplets; an evaporator for receiving said plurality of droplets, and an expansion structure interposed between said condenser and said evaporator, wherein said actuated membrane ejects said plurality of droplets toward said evaporator during refrigerant cycle intervals when said expansion valve is open, and
structure for securing said heat transfer device to an individual.

14. The device of claim 13, wherein said heat transfer device comprises a plurality of said heat transfer devices.

15. The device of claim 13, wherein said heat transfer device is secured to fabric of a clothing article worn by said individual.

16. The device of claim 15, wherein said fabric includes regions of thermal conductivity enhanced relative a bulk thermal conductivity of said fabric in regions where said heat transfer devices are secured.